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for the
Human Research Facility (HRF)
Rack 1

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Rack 1**

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ACRONYMS AND ABBREVIATIONS

ADP	Acceptance Data Package
CCB	Configuration Control Board
CDP	Certification Data Package
Chg	Change
COTS	Commercial Off-the-Shelf
CR	Change Request
DSR	Data Submittal Requirements
EMI/EMC	Electromagnetic Interface/Compatibility
EXPRESS	EXpedite the PRocessing of Experiments to Space Station
FCA/PCA	Functional Configuration Audit/Physical Configuration Audit
FCP	Facility Class Payload
FIAR	Failure Investigation Action/Analysis Report
GASMAP	Gas Analyzer System for Metabolic Analysis of Physiology
GCAR	Government Certification Acceptance Request
HRD	Hardware Requirements Document
HRF	Human Research Facility
IAC	Initial Assessment of Criticality
ICD	Interface Control Document
IFR1	Integrated Flight Rack 1
ISIS	International Subrack Interface Standard
ISS	International Space Station
JSC	Johnson Space Center
KSC	Kennedy Space Center
MPLM	Mini Pressurized Logistics Module
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NSTS	National Space Transportation System
OMRS	Operational and Maintenance Operations Specifications
P/N	Part Number
PCB	Payloads Control Board

ACRONYMS AND ABBREVIATIONS (Cont'd)

PIRN	Payload Interface Revision Notices
PSR	Payload Safety Review
PU	Panel Unit
Qty	Quantity
RPC	Remote Power Controller
S&MA	Safety and Mission Assurance
SCMP	Software Configuration Management Plan
SDD	System Definition Document
SSP	Space Station Program
STS	Space Transportation System
TIA	Tailoring and Interpretation Agreement
UPVP	Unique Payload Verification Plan
US Lab	United States Laboratory
VDD	Version Description Document

1.0 GENERAL OVERVIEW AND PURPOSE

This System Definition Document (SDD) will outline and define the system level requirements applicable to the Integrated Human Research Facility (HRF) Integrated Flight Rack 1 Flight Rack 1 (IFR1) launching on Space Transportation System (STS)-102, flight 5A.1. The intent of this SDD is to identify the overall launch, and subset of operational configurations of the IFR1, as well as to clearly identify HRF IFR1's specific requirement sets. As opposed to being a preliminary design document or a hardware system requirement document, this SDD is based upon actual completed IFR1 activities for launch on 5A.1. This SDD is the base document for certification of the HRF integrated flight rack 1 system for flight 5A.1.

2.0 REFERENCE DOCUMENTS

The documents in this list are referenced within the body of this document and apply to the design of the IFR1 as indicated in the SDD content. The document versions identified are specifically applicable to IFR1.

The primary generic source of requirements for the IFR1 is SSP 57000 E and SSP 57200B, as negotiated between the HRF Program and International Space Station (ISS) Program Payloads Office.

<u>Document Number</u>	<u>Revision</u>	<u>Document Title</u>
JPD 5335.1	C	Lyndon B. Johnson Space Quality Management System (QMS)
KHB 1700.7B	Basic	Space Shuttle Payload Ground Safety Handbook
LS-71000	A	Program Requirements Document for the Human Research Facility
LS-71001	A Chg 3	Functional Requirements Document for the Human Research Facility (HRF)
LS-71002	Basic 7/98	System Safety Program Plan for the Human Research Facility
LS-71005	Basic 2/97	Configuration Management Plan for the Human Research Facility
LS-71016-1	Draft	EMI/EMC Test Plan for HRF Rack I
LS-71020	A	Software Development Plan for the Human Research Facility
LS-71020-1	Basic Chg 2	Software Configuration Management Plan and Procedure for the Human Research Facility

<u>Document Number</u>	<u>Revision</u>	<u>Document Title</u>
LS-71023-1	Basic 9/98	Hardware Requirements Document for the Gas Analyzer System for Metabolic Analysis of Physiology (GASMAP) – Human Research Facility
LS-71027-4	Basic 10/98	HRF Phase III Safety Report
LS-71040-1	Basic 11/99	Hardware Requirements Document (HRD) for the Human Research Facility Ultrasound System
LS-71042-2	Chg 3 5/00	Hardware Requirements Document for the Human Research Facility Workstation
LS-71042-12	C	Version Description Document (VDD) for the Human Research Facility (HRF) Workstation Integrated Load
LS-71046-7	C Chg 1	Version Description Document (VDD) for the Human Research Facility (HRF) Portable Computer Integration Load
LS-71050	Basic	Project Plan for the Human Research Facility
LS-71062	A	Software Requirements Specification (SRS) for the Human Research Facility Common Software
LS-71064-1	Basic	Hardware Requirements Document for the Human Research Facility Cooling Stowage Drawer (CSD)
LS-71144	Basic	Version Description Document (VDD) for the HRF Integrated Flight Rack
NSTS 1700.7B ISS Addendum	Basic Chg 1	Safety Policy and Requirements for Payloads using the International Space Station
NSTS/ISS 13830	C Chg 1	Payload Safety Review and Data Submittal Requirements for Payloads Using the Space Shuttle and International Space Station
NSTS/ISS 18798	B Chg 7	Interpretations of NSTS/ISS Payload Safety Requirements
OMRSD File VIII, Vol II, U9100	Basic	Operations and Maintenance Requirements and Specifications Document
SSP 30695	A 10/94	Acceptance Data Package Requirements Specification

<u>Document Number</u>	<u>Revision</u>	<u>Document Title</u>
SSP 50431	Basic 9/99	Space Station Program Requirements for Payloads, ISS Program
SSP 52050	C	Software Interface Control Document Part 1, International Standard Payload Rack to International Space Station Program, ISS Program
SSP 57000	E	Pressurized Payloads Interface Requirements Document
SSP 57010	B 5/00	Pressurized Payloads Generic Payload Verification Plan
SSP 57100	8/98	Payload Integration Agreement for the HRF
SSP 57100 Addendum 2	6/00	Payload Integration Agreement for the HRF, Increment 2
SSP 57200	B	Human Research Facility – Rack One Hardware Interface Control Document
SSP 57300	C	Human Research Facility Software Interface Control Document
SSP 57400	A	Human Research Facility Unique Payload Verification Plan
SSP 57500	Final Update	Operations Guidelines and Constraints Element-Level Report for Stage 5A.1
SSP 57700		HRF UPVP Verification Report

3.0 SYSTEM DESCRIPTION

3.1 INTEGRATED RACK

The IFR1 flight/operational configuration, Part Number (P/N) SEG46117298-301/307 (See Figure 3.1-1, and HRF IFR1 associated drawing package) is comprised of a rack, sub-rack instruments, and stowage drawers with various stowed accessory items. This HRF IFR1 provides a set of dedicated life sciences experiment equipment to support a research program that will encompass basic, applied, and operational science research on board the International Space Station.

The IFR1 is composed of the subassemblies listed in Table 3.1-1. All IFR1 components were shipped to the launch site as separate subassemblies and then assembled into the IFR1, P/N SEG46117298-301 for further testing at Kennedy Space Center (KSC). Performance verification testing at the integrated level was conducted at KSC prior to integration into the Mini Pressurized Logistics Module (MPLM) for launch on STS-102, flight 5A.1.

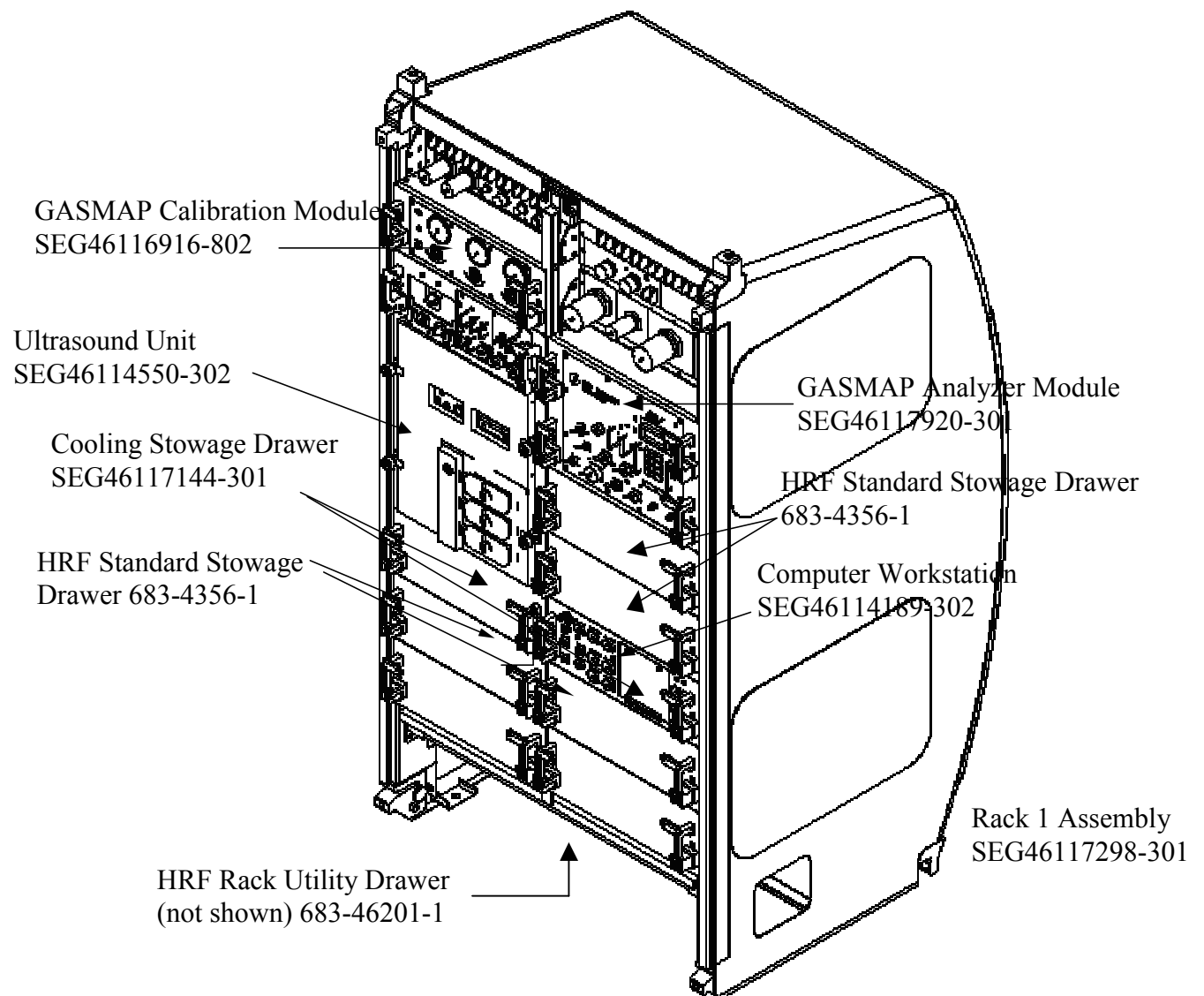


Figure 3.1-1. IFR1 Launch Configuration

TABLE 3.1-1. IFR1 SUBASSEMBLIES

Subassembly	P/N	Qty
“Outfitted” Flight Rack 1	SEG46117303-305	1
Ultrasound Assembly	SEG46114550-302	1
Computer Drawer (Workstation)	SEG46114819-302	1
Gas Analyzer System for Metabolic Analysis of Physiology (GASMAP) Assembly	SEG46117920-301	1
GASMAP Calibration Module	SDG46116916-802	1
Cooling Stowage Drawer	SEG46117144-301	2
4-PU Stowage Assembly	683-43656-1	5

3.2 IFR1 SUBASSEMBLIES

3.2.1 Empty Flight Rack

The Empty Flight Rack, P/N 683-46051-2 (see Figure 3.2-1), was designed, manufactured, tested and verified by Boeing under contract to National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC). The HRF Program procured this rack as a version of the all-drawer EXpedite the PROcessing of Experiments to Space Station (EXPRESS) rack. Therefore, the HRF Rack shares a common set of avionics subsystems with the ISS Program developed EXPRESS racks.

3.2.2 “Outfitted” Flight Rack 1

Upon receipt of the Empty Rack from MSFC, HRF outfitted the rack in preparation for instrument integration with a series of modifications. The modifications to the Empty Rack are detailed in the SED46117303-305 drawing package and were driven by three Change Requests (CRs) presented to the HRF Configuration Control Board (CCB). CR HLP-HDCI-0003 covering the SIR1/SIR9 bracket modification and labeling, CR HLP1-FHD-0001 for acoustic abatement, and CR HLP1-D075-0002 incorporating the addition of a RC filter cable for the mixing fan. The EA5 Division of NASA/Johnson Space Center (JSC) completed modification of the Flight Rack 1 in accordance to existing JSC ISO9000 work instructions, with SR&QA oversight provided by NT.

3.2.3 Drawers

The IFR1 contains both passive and active drawers as indicated in Table 3.1-1. The Workstation, GASMAP, Ultrasound, and Cooling Stowage Drawer are active drawers designed, fabricated, and tested at JSC as part of the HRF Program. The GASMAP Calibration Module is a passive drawer also completed at JSC. The 4-Panel Unit (PU) Stowage Assembly is a passive drawer designed, fabricated, and tested at MSFC as part of the International Subrack Interface Standard (ISIS) project. The 4-PU Stowage Assemblies were delivered to the government under a DD250.

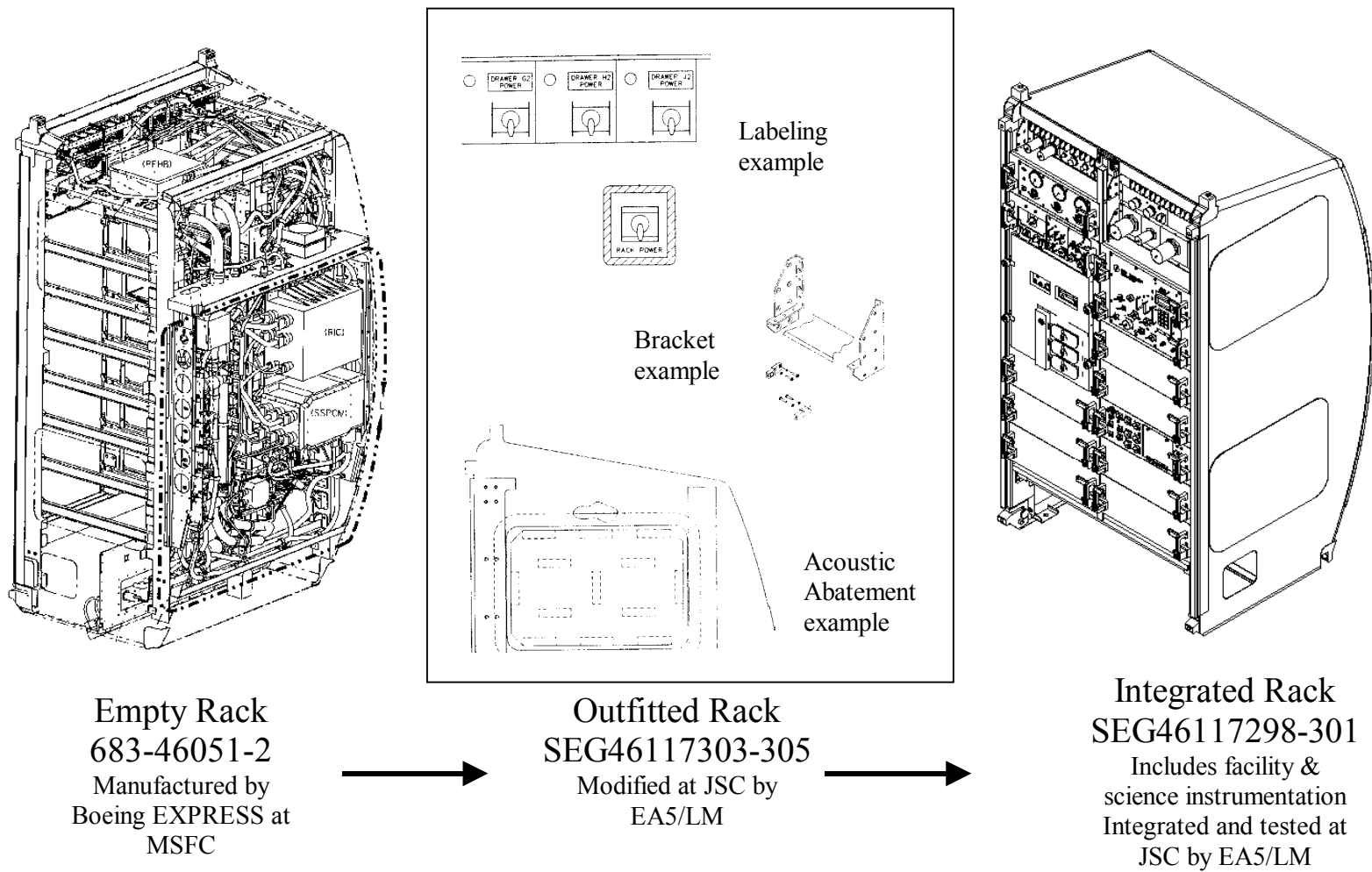


Figure 3.2-1. Rack Modifications, Empty to Outfitted

3.2.4 Stowed Items

The 4-PU Stowage Assemblies, Cooling Stowage Drawers, and the rack Utility Drawer provide stowage capability within the IFR1. Contents include items used with the powered drawer systems and HRF experiment unique equipment. The stowage configuration for launch on STS-102, flight 5A.1, is defined per the drawings identified in Table 3.2-1. Except for the Utility Drawer with contents, all other stowage drawers were integrated with stowed contents and shipped to KSC for rack integration activities. The Utility Drawer and contents were integrated at KSC.

TABLE 3.2-1. IFR1 STOWAGE CONFIGURATION

Stowage Drawer	Rack Location	Drawing
Cooling Stowage Drawer	G1	SEG32105631
ISIS Stowage Drawer	H1	SEG32105666
ISIS Stowage Drawer	J1	SEG32105643
ISIS Stowage Drawer	E2	SEG32105623
ISIS Stowage Drawer	F2	SEG32105642
Cooling Stowage Drawer	H2	SEG32105632
ISIS Stowage Drawer	J2	SEG32105668
Utility Drawer	K	SEG32105630

3.3 SOFTWARE

IFR1 software is required for functions to the ISS vehicle as well as functions internal to the IFR1. The command and data handling interface to the ISS is controlled by SSP 57300, Human Research Facility Software Interface Control Document. The IFR1 software development and performance plans are detailed in document LS-71020, Software Development Plan for the Human Research Facility.

At the top level, the IFR1 software consists of the following:

- Rack Interface Controller software provided by the EXPRESS Program
- HRF Integrated Load for the HRF Workstation – Consisting of HRF Common Software, HRF Instrument software, Experiment software, and Commercial Off-the-Shelf (COTS) software applications
- HRF Integrated Load for the HRF Portable Computer – Consisting of HRF Common Software, HRF Instrument software, Experiment software, COTS software applications, and EXPRESS Rack software
- Embedded COTS Ultrasound software
- Embedded COTS GASMAP software

Specific versions of IFR1 software are identified in the VDD for the HRF Integrated Flight Rack, LS-71144.

The Integrated Loads for the Workstation and Portable Computer are created for each ISS Increment to support software modifications and changes that are unique for the Increment. HRF personnel develop the HRF Common Software and HRF instrument software when not provided by the instrument vendors. All experiment software is provided by the Principal Investigators selected for the Increment. Specific versions of software included in the Integrated Loads for the Workstation and Portable Computer are documented in LS-71042-12 and LS-71046-7, respectively.

4.0 SYSTEM REQUIREMENTS

4.1 INTEGRATED FLIGHT RACK

The global requirements for the IFR1 are developed from the following documents as negotiated and contracted between the ISS Program, the HRF Program, and the NASA NT division at JSC:

LS-71000, Rev A	Program Requirements Document for the Human Research Facility
SSP 57000, Rev E	Pressurized Payloads Interface Requirements Document
SSP 57100	Payload Integration Agreement for the Human Research Facility
SSP 57200, Rev B	Human Research Facility Rack One Hardware Interface Control Document
SSP 57300, Rev C	Human Research Facility Software Interface Control Document
SSP 57100, Addendum 2	Payload Integration agreement for the HRF, Increment 2

Unless otherwise indicated, the primary source for IFR1 requirements is SSP 57000, with the HRF Hardware Interface Control Document (ICD), SSP 57200B, being the secondary source.

4.1.1 Overall Functional Requirements

The IFR1 will meet the following global requirements:

- a. The IFR1 will provide end-to-end data transfers and/or monitoring of scientific instrumentation data necessary for medical research and/or experimentation studies as levied per LS-71050, Project Plan for the HRF, Section 5.2, Paragraph 1.

- b. The IFR1 will interface to the United States Laboratory (US Lab) and be tested per Operational and Maintenance Operations Specifications (OMRS) File No.VIII, Volume II, U9100. (Interface Verification Test and Pre-Flight Check-Out).

4.1.2 Power Performance

Power performance for IFR1 will be in accordance with the following SSP 57000 requirements:

Paragraph 3.2.2.7.1	Interface B (load impedance)
Paragraph 3.2.2.3	Compatibility With Soft Start/Stop Remote Power Controller (RPC)
Paragraph 3.2.1.1.1	Interface B

The IFR1 will be tested to ensure that the above listed requirements are met.

4.1.3 Electromagnetic Interference/Compatibility

The Electromagnetic Interference/Compatibility (EMI/EMC) requirements for the IFR1 are identified in LS-71016-1, EMI/EMC Test Plan for the HRF Rack 1, Section 3.0.

4.1.4 Thermal Requirements

Thermal requirements for the IFR1 are identified in SSP 57200, ICD, Section 3.5.

4.2 SOFTWARE

As previously indicated, the IFR1 software consists of many components with corresponding requirements as follows:

- The Empty Flight Rack software (Rack Interface Controller and laptop software) requirements were derived from the EXPRESS all-drawer rack specification with modifications, principally to the thermal system, as defined by the HRF Program. Per contract to the ISS Program, Payloads Office, it was certified and delivered by MSFC/EXPRESS to the government under a DD250, and the requirements were audited in a Functional Configuration Audit/Physical Configuration Audit (FCA/PCA).
- HRF Common Software and generic COTS applications requirements are documented in LS-71062, Software Requirements Specification for the HRF Common Software.
- Instrument software requirements are defined in the Hardware Requirements Document (HRD) associated with the hardware.

- Experiment software requirements are defined by the Principal Investigator to meet his or her science goals and documented in the experiment System Requirement Document. ISS command and data handling requirements are also indicated in these documents.

Each component was tested and certified based on the applicable requirements. For the Portable Computer and Workstation, the components were integrated, tested, and certified as Integrated Loads and documented in their respective VDDs.

4.3 OPERATIONAL REQUIREMENTS

Payload operational performance requirements for the HRF IFR1 are detailed in Section 3.1 of SSP 57100, HRF PIA; Addendum to PIA for HRF, Increment 2.

4.3.1 Operational Overview

The IFR1 is launched in an MPLM on flight 5A.1. It will then be transferred and installed in the US Lab module of the ISS. Initial facility operations will be installation and checkout of the IFR1. The scope of this SDD deals only with the US Lab operations and the IFR1 configuration detailed in Section 3 of this document.

Science experiments using the IFR1 will be developed and tested on Earth prior to launch. Some experiment protocols will require the crewmembers to wear experiment hardware while performing other duties. HRF operations will generally be phased to correspond with crew arrivals and departures.

As a Facility Class Payload (FCP), the HRF is intended to stay on orbit for a minimum of 10 years. Therefore, the hardware within the IFR1 was designed to be cleaned, maintained, and repaired on orbit. Furthermore, individual hardware items within the IFR1 may be replaced as technology advances or science priorities change.

4.3.2 Operational Constraints

The IFR1 demonstrated compatibility with the US Lab, LAS2, as well as MPLM, STBD Bay 4, through safety and compatibility verification processes. Waivers were processed and approved based on these specific locations. If the rack is moved to other locations, additional audits for requirements need to be performed, and the readdressing of waiver applicability must be performed prior to the IFR1 transfer into other ISS modules. Installation of the IFR1 in other locations is presently beyond the scope of this SDD.

All IFR1 operational constraints are documented in SSP 57500, Operations Guidelines and Constraints Element-Level Report for Stage 5A.1, and will be summarized on the HRF IFR1 Government Certification Acceptance Request (GCAR).

No other IFR1 operational constraints are known pre-launch. Additional constraints may be imposed on IFR1 operations due to limited resources on the ISS (e.g., Power, Thermal) and other non-HRF payload operations.

4.4 SAFETY REQUIREMENTS

The IFR1 is compliant with safety requirements described in NHB 1700.7B, Safety Policy and Requirements for Payloads using the STS, and the associated ISS addendum. The rack, and all associated hardware, completed safety reviews in accordance with the process outlined in National Space Transportation System (NSTS)/ISS 13830, Payload Safety Review (PSR) and Data Submittal Requirements (DSR). The IFR1 Phase 3 Safety Report, LS-71027-4, was reviewed in December 1999. Safety action items and a Safety Verification Tracking Log were generated and will be tracked for open item closure prior to launch. In addition, the IFR1 is compliant with ground safety requirements as described in KHB 1700.7B, Space Shuttle Payload Ground Safety Handbook.

4.5 IFR1 SUBASSEMBLIES

4.5.1 Empty Flight Rack 1

Requirements for the Empty Flight Rack were derived from the EXPRESS all-drawer rack specification with modifications, principally to the thermal system, as defined by the HRF Program. Per contract to the ISS Program, Payloads Office, it was certified and delivered by MSFC/EXPRESS to the government under a DD250, and the requirements were audited in a FCA/PCA.

4.5.2 “Outfitted” Flight Rack 1

No specific requirements exist for the Outfitted Flight Rack that are independent of the IFR1 requirements. The modifications to the Empty Flight Rack were approved through change requests presented to the HRF CCB, as detailed in Section 3.2.2.

4.5.3 Drawers

The scope of this SDD is not to specifically identify drawer requirements. The drawers were certified by individual top assembly part numbers according to their respective requirements document as indicated in Table 4.5-1. Certification and Acceptance Data Packages (ADPs) were assembled for each drawer completed at JSC. Certifications and/or ADPs for drawers that are not completed at JSC will be supplied to JSC by that NASA agency or International Partner.

The IFR1 provides for drawer interchangeability within the rack. The design of the Empty Flight Rack provides interchangeability of the slide guides and blind-mate connectors. The drawers provide interchangeability based on slide design and position as well as the mating connectors to the rack. This interchangeability was

TABLE 4.5-1. DRAWER REQUIREMENT DOCUMENTS

Drawer	P/N	Requirement Document
Ultrasound Assembly	SEG46114550-302	LS-71040-1
Computer Drawer (Workstation)	SEG46114819-302	LS-71042-2
GASMAP Assembly	SEG46117920-301	LS-71023-1
GASMAP Calibration Module	SDG46116916-802	LS-71023-1
Cooling Stowage Drawer	SEG46117144-301	LS-71064-1
4-PU Stowage Assembly	683-43656-1	N/A, DD250

tested through drawer fit checks in each location and data and power testing in each location using a drawer simulator and standardized test. Drawer certification will indicate interchangeability, and the IFR1 certification will indicate the drawer configuration within the rack, if it changes post 5A.1.

4.5.4 Stowed Items

The scope of this SDD is not specifically to identify stowage item requirements. Stowage items were certified by individual top assembly part numbers based on their own individual requirements. Within the HRF Program, stowed contents may be changed from flight to flight and increment to increment. As long as the stowed contents meet all the drawer requirements and those of the IFR1, the capabilities and/or scope of the IFR1's certification do not have to be modified. Any stowage changes will be processed through the HRF CCB, with applicable corresponding actions to update documentation, such as the IFR1 certification and/or acceptance data packages.

5.0 SYSTEM CONFIGURATION MANAGEMENT

5.1 HARDWARE CONFIGURATION MANAGEMENT

The HRF rack is designed to be re-configurable on orbit. Drawers may be changed in terms of rack location and removed or replaced as needed, as long as such modifications are within the scope of the drawer and/or the specific rack integrated system's certification. Modularity at the drawer level makes it possible for new drawers to be added or exchanged with ones in the current launch configuration. Any new drawers will be flight certified prior to launch.

The HRF CCB will address all changes to the flight 5A.1, IFR1 launch configuration. Changes in the IFR1 will also be analyzed to determine if the operating envelope defined in the HRF Flight Rack One Interface Control Document, SSP 57200, will be exceeded. If the operating envelope is not exceeded upon reconfiguration, the new configuration will be added to the top assembly drawing and applicable documentation with no further actions required. If rack configuration changes require

additional interface definition and verification, a change will be processed through the HRF CCB to update the ICD, SSP 57200, and other applicable documentation. If approved, this change will be processed through the Payloads Control Board (PCB) for concurrence by the ISS Program Payloads Office. The new configuration of the Integrated HRF Flight Rack will be tested in applicable HRF ground facilities as defined by the HRF CCB, with results provided as required.

5.2 SOFTWARE CONFIGURATION MANAGEMENT

The IFR1 software is controlled per LS-71020-1A, Software Configuration Management Plan (SCMP) and Procedure for the HRF, and documented in LS-71144, VDD for the HRF Integrated Flight Rack. Changes may be initiated from the ISS or EXPRESS programs as well as the IFR1 subassemblies. All changes will be evaluated by the HRF CCB and impacted for incorporation into the HRF Flight Build. The new HRF Flight Build will be tested in applicable IFR1 subassemblies and HRF ground facilities as defined by the HRF CCB, with results provided as required.

6.0 SYSTEM CLASSIFICATION

According to the guidelines set forth in document SSP 50431, Space Station Program Requirements for Payloads, payload classification was established based on the payload carrier and/or the complexity of the technical interfaces, the ISS technical and financial resources required, operations, and any unique issues associated with the payload. The IFR1 was defined as a facility class payload, with a corresponding life requirement of 10 years based on failure recovery through in-flight servicing and maintenance. The IFR1 meets the 10-year life requirement through rack subassembly servicing as well as availability of drawer replacement. An Initial Assessment of Criticality (IAC) was also completed for IFR1. In this assessment, it was determined that the IFR1 has a Functional Criticality of 3.

7.0 EXCEEDANCES AND WAIVERS

In the cases where HRF requested or were required to pursue a deviation or exceedance from the standard ISS requirements, these exceptions are documented in a set of Payload Interface Revision Notices (PIRNs) processed through the Payloads Control Board. These approved PIRNs then become a part of the HRF IFR1 ICD, SSP 57200.

8.0 QUALITY ASSURANCE AND SAFETY AND MISSION ASSURANCE

8.1 QUALITY ASSURANCE REQUIREMENTS

The IFR1 has been managed under quality assurance requirements as detailed in JPD 5335.1, JSC Quality Manual. A record of all work authorizing documents and discrepancy reports is available through this system.

An ADP will be assembled for the IFR1 in accordance with SSP 30695, Acceptance Data Package Requirements Specification. The IFR1 ADP will be delivered to Quality Engineering for review and final approval. ADPs for JSC-developed subassemblies will be completed in a similar manner. For items not developed at JSC, a copy of the delivered ADP will be provided to the Quality Engineer. This includes the Empty Flight Rack and 4-PU Stowage Assemblies. The ADPs will be filed according to part number in the Quality Assurance Record Center, Building 36.

8.2 SAFETY AND MISSION ASSURANCE REQUIREMENTS

A GCAR form JSC 1296 and an associated Certification Data Package (CDP) will be completed for the IFR1 per established NT work instructions. The GCAR form and accompanying CDP will be delivered to Safety and Mission Assurance (S&MA) for review and final approval. CDPs for JSC-developed subassemblies will be completed in a similar manner. For hardware and/or software items not certified at JSC, a copy of the contractually dictated proof of certification, as well as a copy of the proof of certification from the sponsoring NASA agency or International Provider, will also be provided to S&MA. This includes the Empty Flight Rack and 4-PU Stowage Assemblies. The CDPs for the IFR1, as well as the other JSC provided subassemblies, will be filed according to part number in the JSC Certification Library, Building 45.

8.2.1 IFR1 Certification Scope

The HRF IFR1 and its associated Sub-rack 1 hardware are certified to the specific operational and/or interface locations identified in this SDD and within the Integrated Rack 1 System GCAR. This IFR1 certification will indicate current launch and operational configurations within the rack. If changes are required after the flight of 5A.1, the individual drawer certifications will indicate their own permissible interchangeability. Stowage items are certified by individual top assembly part numbers based on their own individual requirements, and permissible interchangeability constraints, if applicable, will be indicated on individual stowage item GCARS.

The scope of this IFR1 certification may be expanded to account for this hardware's modular design by updating the GCAR and accompanying CDP with the pertinent information to account for additional modifications and/or configuration changes. Such changes may include exchanging instruments within the existing Rack 1, exchanging instruments between Rack 1 and a future Rack 2, or moving an entire rack system to another laboratory module.

8.2.2 IFR1 CDP Items to be Delivered to S&MA

Non-JSC deliverable certification information for 683-46051-2 (empty rack) and 683-43656-1 (ISIS stowage drawers)

- An MSFC Certification of Flight Readiness (CoFR)
- An updated and final ADP

Required Data Items for the Rack 1 System CDP

- GCAR, form 1296
- HRF Program Requirements Document
- HRF Functional Requirements Document
- HRF ICDs
- HRF Unique Payload Verification Plan (UPVP)
- HRF UPVP Verification Report
- Safety Data Package with Signed Phase III Hazard Reports
- Battery Certification Memo
- Materials Certification Memo
- Fracture Control Report
- Materials Usage Agreements
- Structural Analysis Report
- Mass Properties Report
- Thermal Analysis Report
- Air Flow Analysis Report
- EMI/EMC Analysis
- Acoustic Analysis Report
- Power Quality Analysis Summary
- Waivers/Deviations/Exceptions/HRF CCB CRs/TIAs
- FIARs/SCANs
- IAC
- Work Authorizing Documents
- Software Acceptance Data Package
- Engineering Drawing Package
 - Drawing package should contain:
 - Drawing tree (for clarity and traceability)
 - Drawings for the 'flight' rack
 - Drawings for the 'outfitted' rack
 - Drawings for the sub-rack top assemblies
 - Drawings for all other referenced drawings

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